

IN THE CLAIMS

This listing of claims will replace all prior versions, and listing of claims in the application.

1. (Currently amended) A method for building a failover-enabled communications link, comprising:

receiving, by a first Fibre Channel (FC) storage device, input of a plurality of upper-level addresses, based on an upper-level protocol, assigned to a FC port of the first FC storage device, the first FC storage device supporting the FC protocol at a base layer, wherein the plurality of upper-level addresses includes a primary address and a backup address, wherein the backup address is associated with a second FC storage device;

registering, by the first FC storage device, a symbolic name for the FC port of the first FC storage device with a name server, wherein ~~the~~ a symbolic name field is encoded with the plurality of upper-level addresses including the primary address, and ~~encoded with the backup address associated with the second FC storage device; and~~

~~in response to~~ detecting, by the first FC storage device, a link failure between the second FC storage device and a third FC storage device[.];

determining, by the first FC storage device, the backup address based on positions of the plurality of upper-level addresses within the symbolic name field; and

linking, by the first FC storage device, the FC port of the first FC storage device over a fabric network to the third FC storage device using the backup address determined from the symbolic name field ~~registered with the name server and encoded with the backup address associated with the second FC storage.~~

2. (Previously presented) The method of claim 1, wherein the upper-level protocol is a network protocol.

3. (Original) The method of claim 2, wherein the network protocol is the Transmission Control Protocol over the Internet Protocol (TCP/IP), and the upper-level addresses are IP addresses.

4. (Previously presented) The method of claim 1, wherein the symbolic name is encoded with the primary address and backup address based on a predefined encoding scheme.
5. (Previously presented) The method of claim 4, wherein the predefined encoding scheme includes using selected bytes in a symbolic name field defined in the FC protocol to store the primary address and backup address.
6. (Previously presented) The method of claim 1, wherein registering the symbolic name for the FC port of the first FC storage device with the name server comprises:
 - sending a RFT_ID message to the name server for a FC fabric that enables communications between the FC storage devices; and
 - sending a RSPN_ID message to the name server.
7. (Previously presented) The method of claim 1, wherein linking the FC port of the first FC storage device over a fabric network to the third FC storage device comprises:
 - sending, by the third FC storage device, a GID_FT message to the name server;
 - sending a GSPN_ID message to the name server for each port identified in a response to the GID_FT message received from the name server;
 - comparing the upper-level address with the addresses encoded in a symbolic name received in response to the GSPN_ID message from the name server; and
 - mapping the upper-level address to a port ID of the FC node device that has the upper-level address encoded in its symbolic name.
- 8-20. (Canceled)
21. (Currently amended) A storage device, comprising:
 - a processor;
 - a memory coupled to the processor, the memory storing instructions which when executed by the processor cause the storage device to perform a method comprising:
 - receiving input of a plurality of IP addresses to be associated with a first Fibre Channel (FC) N_Port of the storage device, the storage device supporting the FC protocol at a base layer,

wherein the plurality of IP addresses includes a primary IP address and a backup IP address, wherein the backup IP address is associated with a second FC N_Port on a second storage device;

registering, with a name server, the plurality of IP addresses as a symbolic name for the first FC N_Port of the storage device within a symbolic name field, wherein the symbolic name field is encoded with the plurality of IP addresses including the primary IP address, and ~~encoded with the backup IP address associated with the second FC N_Port on the second storage device;~~ and

~~in response to detecting, by the storage device,~~ a link failure between the second storage device and a third storage device[[,]];

determining the backup IP address based on positions of the plurality of IP addresses within the symbolic name field; and

linking the first FC N_Port of the storage device over a fabric network to the third storage device using the backup IP address determined from the symbolic name field ~~registered with the name server and encoded with the backup IP address associated with the second FC N_Port on the second storage device.~~

22. (Previously presented) The storage device of claim 21, wherein the method further comprises registering each communications protocol supported by the first FC N_Port with the name server for a FC fabric to which the first FC N_Port is connected.

23. (Previously presented) The storage device of claim 21, wherein registering with the name server the symbolic name encoded with a primary IP address, and a backup IP address associated with a second FC N_Port on a second storage device comprises a first registration operation to register the primary IP address, and a second registration operation to register the backup IP address.

24. (Original) The storage device of claim 23, wherein the first registration operation and the second registration operation are the same registration operation.

25. (Original) The storage device of claim 23, wherein the method further comprises detecting a failure of a primary link between a pair of remote N_Ports, wherein one of the remote N_Ports has the backup IP address as a primary IP address.

26. (Original) The storage device of claim 25, wherein the second registration operation is performed after detecting the failure.

27. (Currently amended) A computer readable storage medium, having stored thereon on a sequence of instructions which when executed by a processor for a storage device, causes the storage device to perform a method comprising:

receiving input of a plurality of IP addresses to be associated with a first Fibre Channel (FC) N_Port of the storage device, the storage device supporting the FC protocol at a base layer, wherein the plurality of IP addresses includes a primary IP address and a backup IP address, wherein the backup IP address is associated with a second FC N_Port on a second storage device;

registering, with a name server, the plurality of IP addresses as a symbolic name for the first FC N_Port of the storage device within a symbolic name field, wherein the symbolic name field is encoded with the plurality of IP addresses including the primary IP address, and ~~encoded with the backup IP address associated with the second FC N_Port on the second storage device;~~ and

~~in response to detecting, by the storage device,~~ a link failure between the second storage device and a third storage device[[],];

determining the backup IP address based on positions of the plurality of IP addresses within the symbolic name field; and

linking the first FC N_Port of the storage device over a fabric network to the third storage device using the backup IP address determined from the symbolic name field ~~registered with the name server and encoded with the backup IP address associated with the second FC N_Port on the second storage device.~~

28. (Previously presented) The computer readable storage medium of claim 27, wherein the method further comprises registering communications protocols supported by the first FC N_Port with the name server for a FC fabric to which the first FC N_Port is connected.

29. (Previously presented) The computer readable storage medium of claim 27, wherein registering with the name server the symbolic name encoded with a primary IP address, and a backup IP address associated with a second FC N_Port on a second storage device comprises a first registration operation to register the primary IP address and a second registration operation to register the backup IP address.

30. (Previously presented) The computer readable storage medium of claim 29, wherein the first registration operation and the second registration operation are the same operation.

31. (Previously presented) The computer readable storage medium of claim 29, wherein the method further comprises detecting a failure of a primary link between a pair of remote N_Ports, wherein one of the remote N_Ports has the backup IP address as a primary IP address.

32. (Previously presented) The computer readable storage medium of claim 31, wherein the second registration operation is performed after detecting the failure.